

Guidance Document For Determining Solid Waste Landfill Capacity

Purpose and Authority

The purpose of this guidance document is to provide information that will assist owners and operators in determining the solid waste capacity of a landfill. State and local planners and regulators need and utilize accurate information concerning remaining capacity in planning for future development and in managing emergencies to ensure that adequate landfill space is available.

Subtitle II of Title 30 of the Louisiana Revised Statute, Section § 2162, requires that the Secretary of the Louisiana Department of Environmental Quality determine the permitted capacity that is available to safely manage solid waste and shall ensure that sufficient available permitted capacity exists to safely and efficiently manage solid waste resulting from an emergency. Also, permitted capacity must be considered along with other factors in the permitting of solid waste facilities.

The Louisiana Administrative Code, Title 33, Part VII, Subpart 1 requires that solid waste facilities report the estimated remaining permitted capacity (expressed in wet-weight tons) for landfills.

Definitions

Permitted Capacity – the initial total volume of waste expressed in cubic yards that a specific bounded facility (total landfill disposal area) is capable of accepting for disposal under an issued permit, i.e. for the permit's duration.

Used Capacity – the volume of waste expressed in cubic yards that have been disposed into a landfill at a specific bounded facility operating under an issued permit.

Remaining Capacity – the volume of waste expressed in cubic yards that may be disposed into the unused permitted disposal area at a specific bounded facility under an existing permit (for the permit's duration). Remaining Capacity is determined by subtracting the amount of capacity that has been used from the total permitted capacity.

$$\text{Remaining Capacity} = \text{Permitted Capacity} - \text{Used Capacity}$$

Potential Capacity – the volume of waste expressed in cubic yards that may be disposed into an area that is not yet permitted. This disposal area must be contiguous to the permitted area, must be part of the permittee's master plan, and must be available for consideration as a modification to the permit or in a renewal application. Potential Capacity represents an increase in permitted disposal area.

Considerations for Determining Landfill Capacity

Settlement in landfills usually results from consolidation of in-place refuse. Consolidation occurs when initial void (air) spaces in the refuse are replaced with surrounding waste and can be the result of additional refuse placement and/or the decomposition of the existing waste. Settlement is usually a process that occurs over time and is difficult to notice on a day-by-day basis.

Settlement rates vary with the type of refuse placed, operational techniques (compaction efforts and equipment), as well as climatic conditions (dry versus moist). The settlement rate of a landfill varies with time.

Typically, primary settlement occurs within the first few years of refuse placement and long term or secondary settlement occurs over an extended period of time. The gradual action of landfill settlement can have the effect of increasing landfill space over time.

Settlement can be minimized by greater compaction effort (increasing compaction equipment weight or additional passes with existing equipment) during the placement of waste. The additional action forces more waste into a smaller area.

Cover is the material applied at the end of the operating day, or at a frequency specified by the facility's permit, to a unit, the working face of a unit, or a facility. A refuse-to-cover ratio is the volume of refuse disposed in a day to the volume of daily cover. The volume of daily cover must be considered when determining space available for disposal of waste and must be included in capacity calculations.

The key component of evaluating capacity and projecting remaining capacity in wet tons is the estimation of the waste density. Since most landfills accept a variety of waste materials, the waste mass is not a homogeneous material. Thus, an estimation of the total waste density can be determined using two factors that may be measured directly. These two factors are the total wet tons received during a period of time and the total fill volume in cubic yards over the same period of time. The wet tons may be obtained from scale records. The fill volume may be

obtained from survey. The estimation of density also considers the effects of settlement and cover soil usage, as it will be affected by both.

For example, 1200 pounds of refuse may occupy 1.0 cubic yard of landfill space when initially placed into a landfill. Over time, settlement occurs consolidating the 1200 pounds of refuse resulting in only .75 cubic yards of landfill space being used. This represents an additional 25 percent of space (capacity) available for refuse placement.

Therefore, the estimation of density over a defined period of time may be computed as follows:

$$\text{Density} = \text{Total wet tons received from scale records} / \text{total bank cubic yards of fill}$$

Methods for Determining Landfill Capacity

Three common methods for determining landfill capacity are:

1. Topographical Survey Methods
2. Weight-Based Methods
3. Other Methods (approved by the Department of Environmental Quality)

Topographical Survey Methods

Topographical surveys (including aerial methods) have been shown to be the most accurate method for determining volumetric quantities at a landfill and the most valuable for long-term planning. The volumetric quantities can be determined for the past, current, or the final volume for a landfill.

Topographical mapping is the process of graphically representing natural and man-made features for a given locality and for a determination of the configuration of the terrain on a map. By means of various lines and conventional symbols, topographic maps are produced from survey data. Names, legends, and various lines are used to identify features such as roads, trees, streams, lakes, trails, buildings, and boundary lines on the map.

Topographical surveys must be performed under the direct supervision and control of a professional land surveyor or civil engineer licensed by the State of Louisiana.

Weight-Based Methods

Weight-based estimates for determining landfill capacity convert weight data to volume using the estimated in-fill density of waste materials as previously described. The converted volume

of material is subtracted from the permitted capacity to obtain the remaining capacity. This method requires no special expertise beyond careful record keeping and conducting basic mathematical calculations and using a scale for weighing the amount of waste received.

A variation of the weight-to-volume conversion method is the in-truck volume to land filled volume conversion method. This method, which can be used by landfill operators who do not have a truck scale, involves measuring the volume of materials in trucks arriving at the facility, making assumptions about the compact ability of these materials, and calculating the in-place volume of the materials. The landfill operator uses the calculated volume of land-filled material and refuse-to-cover ratios to derive an estimate of the amount of landfill space used. This method requires tracking incoming loads by truck type, size, and fullness.

Calculating remaining capacity using the weight-based method may take from several hours to several days depending on the following factors:

- The size of the landfill.
- The completeness of records of in-coming material.
- Daily and intermediate cover usage.
- Basic operating parameters (such as weight of equipment, average number of passes, depth of spread material, slope of working face).

If an assessment of remaining capacity has not been performed for a number of years, then operators can assume that they will spend considerable time and effort the first time this method is used. However, subsequent annual updates should be relatively simple and quick, particularly if operating parameters and the character of the waste stream do not change significantly and if records are complete and accurate.

Other Methods

The selection of a method to be used to determine the capacities of a landfill is a site-specific decision. An alternative method for determining capacities may be submitted by an owner/operator of a landfill and will be considered for approval by the department. The department staff is available to assist you in the selection of a method and in determining capacities.

If you have any questions regarding determining capacities or this guidance document, please contact one of the following:

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